

Appl. No. 09/781,786
Amdt. dated July 9, 2003
Reply to Office action of April 11, 2003

REMARKS/ARGUMENTS

Claims 1-44 as amended through Amendment D filed February 3, 2003 are presently pending in the application. In this amendment, Claims 19-27 have been withdrawn as being directed to a non-elected invention; Claims 1, 4, 14 and 29-44 have been amended; Claim 28 has been canceled; and Claim 45 has been added to replace Claim 28. In accordance with the new rules, all the remaining claims are shown above with the amended claims shown in a redlined format. The amendment to the specification is made by replacing the noted paragraphs with the paragraphs set forth above. As set forth below, the amendments to the Claims are believed to place the Claims in condition for allowance. In view of the amendments, as discussed below, reconsideration of the Application and issuance of a Notice of Allowability are respectfully requested.

Initially, Applicant has amended the specification at Pages 3 and 7 as noted above to correct typographical errors. These noted amendments to the specification do not add new matter to the application.

The Examiner objected to Claims 12-13 under 37 C.F.R. §1.75(c) asserting that Claims 12 and 13 fail to further limit the subject matter of a previous claim. Claims 12 and 13 both depend from Claim 1. Claim 1 is directed to a multi-layered filter media wherein the fibers of the different layers have different thicknesses and pore sizes. Claim 1 further provides that "the fiber sizes and pore sizes of said

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successive adjacent face-to-face thicknesses of fibers [are] calculated including factors of thicknesses and relative pore sizes of each layer to take in to account the differences in thickness, porosity, pore and fiber sizes between layers." Claim 12 provides the formula for determining the average pore size of the layered filter media and Claim 13 provides the formula for determining the air frazier, permeability of the layered filter media. Although Claim 1 sets forth that the fiber sizes and pore sizes "are calculated", Claim 1 does not set forth formula used in the determination of the fiber and pore sized. Claims 12 and 13 provide formulas used in this determination. Thus, in view of the fact that Claims 12 and 13 provide added detail to the subject matter of Claim 1, Claims 12 and 13 are both believed to further limit Claim 1, and hence, are believed to comply with the requirements of 37 C.F.R. §1.75(c). Withdrawal of this rejection is respectfully requested.

The Examiner objected to the drawings noting that reference no. 43 (mentioned at page 9) is not set forth in the drawings, and that reference numbers 21', 37' and 38' on FIG. 1B are not mentioned in the disclosure. Ref. No. 43, as set forth in the specification, refers to a spray mechanism. FIG. 1A has been amended to add a spray mechanism similar to the spray mechanisms 39 and 41. Inasmuch as the spray mechanism 43 is referenced in the specification, this amendment to FIG. 1A to add the spray mechanism to the drawing does not add new matter. A new sheet of formal drawings will be supplied upon approval of the drawing changes by

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the Examiner.

Applicant respectfully notes that reference numbers 21', 37', and 38' were added to the specification at page 9 thereof in the Amendment C filed October 19, 2002. The Examiner is thus requested to withdraw this objection to the specification.

The Examiner rejected Claims 1-18 under 35 U.S.C. §112, first paragraph, asserting that the Claims 1 and 18 contain subject matter not described in the specification in such a way as to enable one skilled in the art to which it pertains to make and/or use the invention. Specifically, at the end of paragraph 5 (page 4 of the Office Action) the Examiner asserts that "applicant has not explained how these calculations result in a novel layered filtration media nor how these calculations would help to (sic) one skilled in the art to make or use the layered media". Applicant respectfully asserts that Claims 1 and 18 are both in compliance with §112, ¶1. When designing a layered filter media, the designer will design the filter media to have a desired air flow and pressure drop as necessitated by the environment in which the filter media will be used. The air flow through the layered filter media and the pressure drop across the layered filter media is dependant upon the porosity of the different layers of the filter media. One skilled in the art would appreciate that by using Applicant's formulas, the designer will be able to closely estimate the average pore size and air frazier permeability of a resulting multi-layer filter media when the designer knows the mean pore flow diameter and air frazier permeability of the

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independent layers of the filter media. Applicant's equations will therefore enable the designer to produce a multi-layered filter media to have a predetermined overall average pore size without the need to experiment. Stated differently, if the designer is designing a three-layered filter media to have an overall average pore size M, the designer can determine average pore sizes M_1 , M_2 , and M_3 of the three layers which will produce the desired overall average pore size M. Hence, the designer will not have to experiment with different average pore sizes when designing the multi-layered filter media. Therefore, Applicant respectfully asserts that one skilled in the art of designing multi-layered filter media will understand how the equations and calculations set forth in Claims 1-18 will assist him in his endeavor. Withdrawal of this rejection is respectfully requested.

The Examiner rejected Claims 28-44 under 35 C.F.R. §101 asserting that the claimed invention is "not supported by either a substantial or credible asserted utility or a well established utility." As discussed below, Claim 28 has been canceled without prejudice to filing a continuation with respect thereto and has been replaced with new Claim 45. Claims 29-44 have been amended to depend from new Claim 45. New Claim 45 is a combination of Claims 18 and 25, and the subject matter of Claim 25 which has been incorporated into Claim 35 has been amended such that Claim 45 is in compliance with both 35 U.S.C. §101 and §112.

The Examiner rejected Claims 1 and 6 under 35 U.S.C. §102 as being
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anticipated by the A-P reference. Claim 1 has been amended to provide that each thicknesses of the filter media is comprised of "selected filter fiber of differing denier sizes"; that one of the layers is an upstream layer; that one of the layers is a downstream layer; and that the upstream layer or thickness of the multi-layer filter is made from finer fibers than the downstream thickness. Hence, the downstream thickness is more porous than the upstream thickness.

That the thicknesses can comprise fibers of different deniers is set forth in the application at page 8, where the application provides that "In accordance with the present invention and based on environmental conditions the fibers fed to mixer-blenders 9, 11, and 12 can be of several combinations of coarse, fibers, intermediate fibers, and fine fiber layers." Additionally, the fiber make up of a coarse, intermediate, and fine layer is set forth in the first half of page 9 of the specification. The composition of the various thicknesses is also set forth in Claims 14 and 15, for example. Hence, the amendment to Claim 4 is not believed to add new matter to the application.

The A-P reference, which was authored by Applicant, teaches a multi-layer filter media, and that the pore sizes of the two layers are different. However, the A-P reference does not teach or suggest that the filter thicknesses each be comprised of "multiple selected filter fiber sizes" as currently set forth in Claim 1. In view of this, the A-P reference is not believed to anticipate or make obvious the subject matter of

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Claim 1. Claim 6 depends from Claim 1 and is similarly not believed to be anticipated by the A-P reference.

The Examiner rejected Claims 12 and 13 under 35 U.S.C. §103 as being obvious over the A-P reference. Claims 12 and 13 both depend from Claim 1 and provide the equations used to determine the overall average pore size (Claim 12) and the overall air frazier permeability (Claim 13) for the multi-layered filter media. Applicant respectfully submits that neither of these equations are taught or suggested by the A-P reference. While the A-P reference does teach that the air frazier permeability of the various layers can be used to determine the air frazier of the multi-layer filter media, the A-P reference does not teach or suggest that the equation also include the porosity of the individual layers. In view of the fact that the A-P reference does not teach or suggest that the overall air frazier equation should include porosity, the A-P reference is believed to teach away from Claim 13. Similarly, the A-P reference teaches only that permeability of the different layers can be used to determine the overall permeability of the multi-layer filter media. However, the reference does not teach, suggest, or even discuss the overall average pore size of the filter media, which is what is being calculated in the equation of Claim 12. Further, in no equation in the A-P reference is porosity included in the same equation as pore size or air permeability. Thus, the A-P reference is not believed to teach or suggest the subject matter of Claims 12 or 13. Claims 12 and

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13 are thus both believed to be allowable over the A-P reference.

The Examiner rejected Claim 2 under 35 U.S.C. §103 as being unpatentable over the A-P reference in view of Alkire et al. (Pat. No. 5,885,390) and Ahr (H1 909). Initially, Applicant notes that Ahr is directed to an absorbent composite. As set forth in the abstract, this absorbent composite is for use in sanitary napkins and diapers. Applicant notes that Ahr is classified in a much different section than the preliminary class for this application. Ahr is classified in class 156/296 and this application is preliminarily classified in class 210. Further, one skilled in the art of designing filters (which allow fluids to pass therethrough) could hardly be expected to look to absorbent media art (which absorb fluids) in designing a filter. Thus, Applicant respectfully asserts that Ahr is not analogous art, and requests that the Examiner remove Ahr as a reference.

In any event, Claim 2 depends from Claim 1. Neither, Alkire et al. nor Ahr (should the Examiner decide to retain it as a reference) teach or suggest that the filter media thicknesses each be made from multiple fiber sizes. While Alkire et al. teach and suggest that a mat can be made from the glass fibers of their invention, they do not teach or suggest that the mat (or other product) is produced from fibers of differing denier sizes, as set forth in Claim 1. Ahr teaches that chemically stiffened cellulosic fibers can be added to an adsorbent gelling material to form an adsorbent composite. Ahr does not discuss the size or diameter of the fibers used in the

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adsorbent composite, and hence, does not teach or suggest the use of multiple fiber deniers in a filter media layer. Hence, neither Alkire et al. nor Ahr, when combined with the A-P reference, teach or suggest the subject matter of Claim 1. Thus, the combination does not teach or suggest the subject matter of Claim 2. Claim 2 is thus believed to be allowable.

The Examiner's rejected Claims 3-4 and 11 under 35 U.S.C. §103 as being unpatentable over the A-P reference in view of Badalato et al. (Pat. No. 4,732,675). Claims 3, 4 and 11 all depend from Claim 1. Badalato et al. disclose that the denier of the upstream layer and the first downstream layer should range from 4-5 and that the denier of the second downstream layer of fibers should range from about 22-28. (Col. 2, lines 33-35 and lines 47-49). Neither the A-P reference nor Badalato et al. teach or suggest that the different layers of the filter media each comprise fibers of different deniers, as now set forth in Claim 1. Thus, Claims 3, 4 and 11 are believed to be allowable due to their dependency from Claim 1.

Claim 4, however, has been amended to provide that "each of the thicknesses comprise at least three (3) different denier fibers" with the deniers as specified in the last two lines of Claim 4. As just noted, neither Badalato et al. nor the A-P reference, whether considered individually or in combination teach or suggest this. Hence Claim 4 is believed to be allowable independently of Claim 1.

The Examiner rejected Claims 5 and 7-8 under 35 U.S.C. §103 as being
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unpatentable over the A-P reference in view of DeVilliers et al. (Pat. No. 5,480,464).

Claims 5 depends directly from Claim 1 and 7-8 all depend from Claim 1 via Claim 6.

Claims 5 and 7-8 are believed to be allowable due to their dependency from Claim 1.

The Examiner rejected Claims 9 and 10 under 35 U.S.C. §103 as being unpatentable over the A-P reference in view of DeVilliers and further in view of Cusick et al. (Pat. No. 5800586). It is noted that Claims 9 and 10 depend from Claim 1 by way of Claims 6 and 7. Claims 9 and 10 are thus believed to be allowable for the reasons noted above in conjunction with Claims 1 and 7.

The Examiner rejected Claim 14-17 under 35 U.S.C. §103 as being unpatentable over the A-P reference in view of DeVilliers. Claims 14-17 each depend directly from Claim 1 and set forth different denier compositions for the various layers of the filter media and are therefore allowable for the reasons noted above in conjunction with Claim 1. Further, it is noted that although DeVilliers discloses using multiple denier fibers for the downstream (or back layer) of the filter media DeVilliers does not teach or suggest the relative percentages of the different fibers. Further, DeVilliers teaches that the upstream or face layer is formed from only one fiber thickness. Thus, DeVilliers does not teach or suggest that *both* layers are made from fibers of multiple thicknesses or deniers. In fact, DeVilliers' teaching that the "face layer is formed of 100% polyester staple fibre having a thickness rating of about 3 Denier ..." is believed to teach away from Applicant's claimed invention in

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which all the layers of the filter media are made from fibers of multiple deniers. Hence, Claims 14-17 are not believed to be obvious over the cited references and are believed to be in condition for allowance.

The Examiner rejected Claim 18 under 35 U.S.C. §103 as being unpatentable over the A-P reference in view of Alkire, Ahr, and Badolato. Claim 18 is directed to a multi-thickness filter media comprised of "at least three different fiber sizes" where "the carded fibers in said thicknesses being calculated including factors of thicknesses, pore and fiber sizes of each layer to take in to account the differences in thickness, porosity, pore and fiber sizes between layers with said porosity in such an arrangement comprising the ratio of pore volume to the total volume of filter media so that the overall average pore size of that of adjacent successive thicknesses is smaller than that of the average overall pore size of said independent finest fiber thickness" by the two formulas set forth in Claim 18. None of the cited references teach or suggest that the fiber sizes for the thicknesses (or layers) of the filter media be calculated using "factors of thicknesses, pore and fiber sizes of each layer to take in to account the differences in thickness, porosity, pore and fiber sizes between layers" as is set forth in Claim 18. Further, none of the cited references teach or suggest the equations for mean flow pore diameter of for air frazier velocity in Claim 18. Hence, Claim 18 is not believed to be anticipated nor made obvious by the art of record, whether considered individually or in combination. Claim 18 is thus believed

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to be allowable.

The Examiner issued rejections to Claims 19-22 and 25-26. However, these claims have been withdrawn from consideration, and therefore this rejection has not been responded to.

New Claim 45 is directed to a method of manufacturing a multi-layer filter media comprising at least two successive layers of face-to-face filter media. The method includes first selecting an overall average pore size for the combined successive layers of face-to-face filter media and then calculating the average pore size for each of the different layers taking into account differences in thickness, pore size, fiber size, and porosity of the different filter layers. The filter fibers for the different layers are then selected and the different layers are formed to have pore sizes corresponding to the calculated pore sizes. The layers are then assembled such that the multi-layer filter media has an overall average pore size substantially corresponding to the selected overall average pore size, the overall average pore size being smaller than the finest pore size of the layers of the filter media.

The specification has been amended at page 15 to include a new paragraph which provides literal support for the method as now claimed. Neither the added paragraph nor new Claim 45 add new matter to the application. One skilled in the art of designing multi-layer filter media would be well aware that the starting point in designing such a filter media is to select the desired properties for the multi-layered

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filter media. One of these properties is the overall average pore size for the combined multi-layer filter media. Additionally, one skilled in the art would know by reading the specification that, once an overall average pore size has been selected, that using Applicant's formulae which take into consideration factors such as the differences of thickness, pore size, fiber size and the porosity of the filter media layers, the designer can determine the pore size for the various layers that will result in the selected pore size, and which will satisfy the requirement that the selected overall average pore size for the combined multi-layered filter media will be smaller than the smallest of the average pore size of the different layers. From the specification, and using this information, one skilled in the art would understand that the different layers can be formed using fibers of selected deniers to produce layers of filter media having the calculated average pore sizes. This will result in a multi-layer filter media which will have an overall average thickness which will approximate the selected overall average thickness for the multi-layer filter media. Because this method is inherent from the description, no new matter is added to the application by either the amendment to the specification or by the addition of new Claim 45.

The claims were rejected over various combinations of the A-P article and the Alkaire, Ahr, Badolato et al., DeVilliers, Cusick et al., and Tani et al. patents, none of the patents, whether considered individually or in combination teach or suggest the

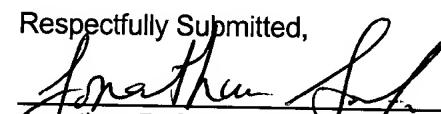
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claimed subject matter of new Claim 45. That is, none of the references teach or suggest that a multi-layered filter media can be formed by first selecting the overall average pore size for the combined multi-layered media, and then, based on the differences in the thicknesses for the layers, and the sizes of fibers used to produce the layers, determine the average pore size for the different layers. The different layers can then be formed to have average pore sizes corresponding to the calculated pore sizes for the different layers to thereby produce a multi-layer filter media have an overall average pore size corresponding substantially to the selected overall average pore size. Hence, Claim 45 is believed to be in condition for allowance. Claims 29-44 have been amended to depend from Claim 45 and are believed to be allowable for the same reasons as Claim 45.

In view of the foregoing, Claims 1-18 and 29-45 are believed to be in condition for allowance. A Notice of Allowability with respect to these claims is thus respectfully requested.

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Respectfully Submitted,


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